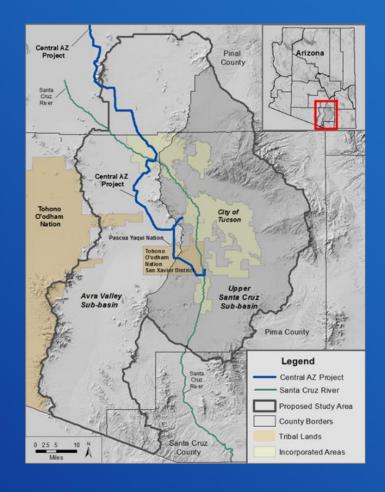
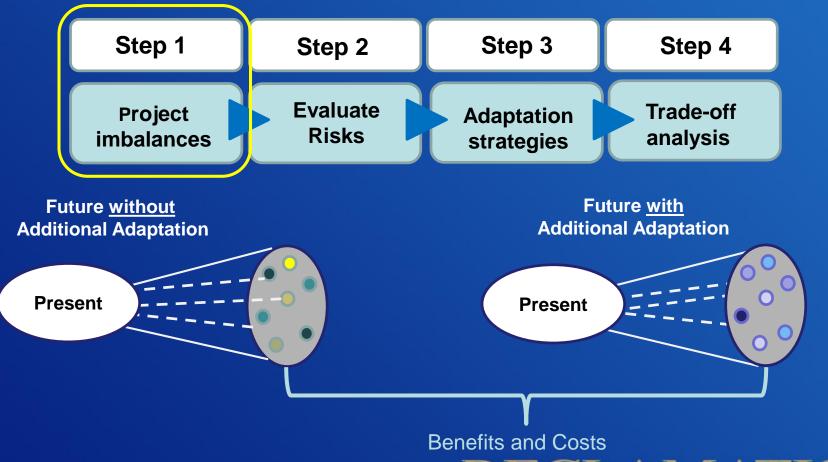
# Lower Santa Cruz River Basin Study:

Study Progress,
Review of
Modeling Framework
and Next Steps

Eve Halper
Water Resources Planner
Bureau of Reclamation
Project Team Meeting #8
April 2, 2018



#### **Study Process Overview**



## Simplified Modeling Overview

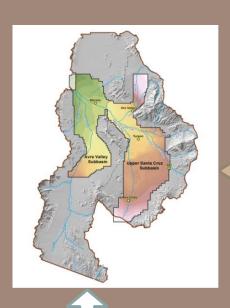
Tucson AMA
Groundwater Model

Climate
Driving Forces

(Precipitation, Temperature)

GLOBAL CLIMATE MODELS

SURFACE HYDROLOGY MODEL



Socio-Economic Driving Forces

(Demographics, Economics, Technological, Regulatory)

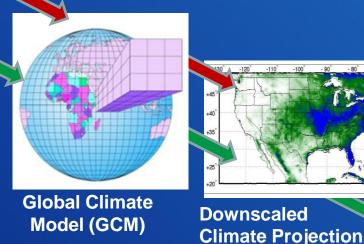
CAP SERVICE AREA MODEL

**900** 

-8.5 -6.0**-4.5 -2.6** 2060 2080 Year

**Emissions Scenarios** 

Which GCM(s) and Downscaling Method(s) are appropriate for our Study?



**LSCR Basin Study Climate Modeling Detail** 



Now 2060

T, P

Now

2060

## RECLAMATI

## **Development of Climate Metrics of Concern**

- All Teams Climate Metrics Webinar held on 12/1/2017
- Metrics suggested by partners and sub-team members:
  - Winter versus summer precipitation
  - Monsoon precipitation, especially time of onset
  - Length of pre-monsoon dry season
  - Frequency of intense winter storm events
  - Intensity of precipitation
  - Extreme temperatures
  - Seasonal evaporation rates
  - Length and timing of winter freeze
  - Ability to reproduce spatial variability within the basin
  - Effects of atmospheric rivers





## Development of Climate Metrics of Concern, con't

- From partner / stakeholder input, UA / Reclamation Technical Team selected 5 key metrics:
  - Average monthly precipitation (winter vs. summer precipitation)
  - Extreme precipitation events by month (precip intensity & frequency)
  - Extreme monthly temperatures
  - Date of Monsoon Onset
  - Date of Last Winter Storm

Together these compose the length of the dry season

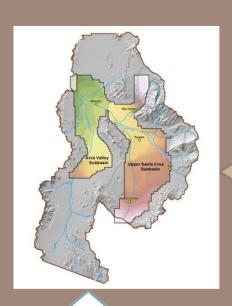
#### Simplified Modeling Overview Recap

## Tucson AMA Groundwater Model

Climate
Driving Forces
(Precipitation,
Temperature)

GLOBAL CLIMATE MODELS

SURFACE HYDROLOGY MODEL



Socio-Economic Driving Forces

(Demographics, Economics, Technological, Regulatory)

CAP SERVICE AREA MODEL

#### **CAP:SAM to Groundwater Model Detail**

	Low Risk	_	ligh Risk		
Driving Forces	Demand Scenario 2 Slow Compact Growth	Demand Scenario 3 Slow Outward Growth	Demand Scenario 1 Baseline	Demand Scenario 4 Rapid Outward Growth	Demand Scenario S Rapid Outward Growth Plus Mining and no Replenishment
Demand Scenario Summary	Low growth unies: condensed growth pattern, no additional mines, no overdraft in Green Valley	Medium growth series: outward growth patters, new mine development, replanish Green Valley	Medium growth series	High growth series: outward growth pattern, new mine development, replenish Green Valley	High growth series: outward growth pattern, mining growth, bonepienishment in Green Valley
Municipal Demand: Population Growth Rate	Low Series	Medium Series	Medium	High Series	High Series
Municipal Demand: Infill vs. Outward Growth	In Fill/Redevelopment	Slow Outward	Official Projection	Rapid Outward	Rapid Outward
Municipal Demand: Gallons Per Household Unit Per Day	Decline faster than expected	Decline as expected	Decline as expected	No change in current GPHUD	No change in current 6FHIJD
Municipal Demand: Additional recharge	Year 2020	Year 2090	per current CAP-SAM assumptions	Year 2010	Neuer
Municipal Demand: Develop Ag Land or Undeveloped Land	Low GPHLID development tends to replace high water use ag land.	CAP-SAM Rassine	Official Projection	Higher GPHLID development occurs on undeveloped land before replacing agriculture	Higher GHHUb development occurs on undeveloped land before replacing agriculture
Agricultural Demand: Consumptive Use (CU) Crop	Some ag areas convert to low CU crops	No change in CU crops	Official Projection	Some ag areas convert to higher CU crops	Some ag areas convert to higher CU crops
Agricultural Demand: Groundwater Savings Projects	Highest savings start 2018	Highest savings start in 2018	per current CAP-SAM assumptions	Half of highest savings start in 2025	No cavings
Industrial Demand: Manufacturing	Slow economic growth and/or greatly improved water use efficiency	Moderate economic growth within existing water service areas, expected improvements in efficiency	Official Projection	Rapid economic growth that depends on groundwater, minimal improvements in efficiency	Rapid economic growth that depends on groundwater, minimal improvements in efficiency
Industrial Demand: Mining	No new mines	New mine in 2020-2030	Official Projection	New mine in 2020-2010, Existing mines expand	New mine in 2020, Existing mines expand
Environment's Demand: Exparian Evapotranspiration	Changes with climate and availability of surface water and shallow groundwater	Changes with climate and availability of surface water and shallow groundwater	Official Projection	Changes with climate and availability of surface water and shallow groundwater	Changes with climate and availability of surface water and shallow groundwater

**Demand Scenario** 

CAP Service Area Model

Demand Scenario X				
Water Provider	Total Demand per Unit Time			
Tucson Water	Y(TW)			
Metro Water	Y(Metro)			
Marana Water	Y(Marana			

Demand Scenario X – Example: Metro Water

Total Demand per Unit Time	Well A	Well B
Period 1	A1	B1
Period 2	A2	B2
Period 3	А3	В3

This step is performed by water providers within the Demand Sub-teams

#### **Next Steps - Climate**

- Complete Evaluation of Climate Models for Best Case / Lower Risk and Worse Case / Higher Risk Emissions Scenarios
- UA / Reclamation Technical Team will recommend the downscaled projections to use for each case to Project Team
- Project Team can approve selection or ask for modifications

### Next Steps – CAP:SAM Results

- When the combinations of climate and demand scenarios have been selected, CAP staff will complete CAP:SAM model runs and provide total demand values through time to water providers
- As part of the demand sub-teams' activities, water providers will develop information on which wells would be pumped through time given the demand projected by the CAP:SAM
- This information will be provided to a groundwater modeler in Reclamation's Technical Service Center for input into the Tucson Active Management Area Groundwater Model

## **Update on Time Extension / Budget Request**

- Reclamation's Lower Colorado Regional Director approved request
- Memo has been forwarded to Reclamation's Policy Office
- No word on when a response will be received

## Questions?